

Original Communication

## Prevalence of pulmonary thromboemboli among referred cadavers having hospitalization records to Tehran Legal Medicine Center

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### Abstract

**Background:** Pulmonary thromboemboli are one of the main causes of sudden death especially in hospitalized patients and appeared with different nonspecific manifestations. The aim of this study was to determine the prevalence of thromboemboli.

**Materials and methods:** In this cross sectional study, pulmonary autopsies of 200 cadavers who were selected randomly from all cadavers with clinical suspicion of thromboemboli referred to Tehran University Tissue Archive in different months from January 2005 to 2006 and the prevalence of pulmonary embolism in these cases and its relation with demographic characteristics and sources of disease was assessed. Also, agreement degree of clinical and histopathological diagnosis of pulmonary embolism was calculated.

**Results:** The prevalence of pulmonary embolism was estimated at 13.5%. There were positive relationship between prevalence of pulmonary embolism and increased of age ( $P = 0.001$ ). Interpretation of results of macroscopic and histopathological studies for diagnosis of embolism showed moderate agreement ( $\kappa = 0.59$ ) and interpretation of results of clinical diagnosis of disease before death and pathologic findings after death showed poor agreement ( $\kappa = 0.34$ ). The most frequent detected location of emboli were end branches of pulmonary artery.

**Conclusion:** Considering the apparent high prevalence of pulmonary embolism in our study, we recommend increased use of anti-deep vein thrombosis measures in all appropriate patients within the Tehran hospital population, according to evidence-based guidelines.

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**Keywords:** Pulmonary embolism; Cadavers; Autopsy; Pulmonary infarction

### 1. Introduction

Pulmonary thromboemboli are one of the main causes of sudden death especially in hospitalized patients and appeared with different nonspecific manifestations. There-

fore diagnosis of this complication is difficult in clinical wards. In half of the thromboemboli cases, this complication was diagnosed on the basis of autopsy.<sup>1</sup> Patient's age and background, source, size, and the final position of thromboemboli and pulmonary infarcts all have major roles in clinical manifestations of thromboemboli. Clinical symptoms as a method for diagnosis of thromboemboli have low sensitivity. Other methods such as pulmonary

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artery angiography and MRI are expensive and the opportunity for management of disease in these methods is also lost.

In previous similar studies, the prevalence of thromboemboli was estimated 8.3–14.7%. Most of the patients were more than 50 years old and in 12.5% of patients' diagnosis before death was correct. It was found no significant relation between thromboemboli and gender and the most important disease correlated to thromboemboli was cardiovascular disease.<sup>3–6</sup>

The aim of this study was to determine the prevalence of thromboemboli.

## 2. Materials and methods

This study was approved by the Ethics Committee of Tehran Legal Medicine Center and Tehran University of Medical Sciences. Annually, about 10950 cadavers are referred to this center that one-fourth of cases are coronial and others are related to sudden death, thromboemboli, and other etiologies referred from hospitals. In this cross sectional study, pulmonary autopsies of 200 cadavers who were selected randomly from all cadavers with clinical suspicion of thromboemboli referred to Tehran University Tissue Archive in different months from January 2005 to 2006 were assessed. Pulmonary embolism was considered to be present if any antemortem thromboemboli were identified. Hospital records of all cases in whom pulmonary embolism was found at autopsy were reviewed (included age and sex, length of stay in hospital, predisposing factors and other diseases, and any interventions). Pulmonary embolism was interpreted as cause of death if death was not otherwise explained or if death was associated with acute cardiopulmonary arrest or rapidly progressing respiratory failure and pulmonary embolism was found in the proximal pulmonary arteries at autopsy. Pulmonary embolism was considered to have contributed to death if the clinical and pathologic data indicated that the case would not died of his underlying disease at that time if pulmonary embolism had not occurred.<sup>7</sup>

Tissue had been formalin-fixed and embedded in paraffin. Three areas of the lung, representing the distributions of pulmonary artery, were chosen in advance of the study. Eight micron thick sections were cut and mounted on slides. Specimens were stained with hematoxylin–eosin and were examined, blinded to all information.

Results were reported as the mean  $\pm$  standard deviation (SD) for quantitative variables and percentages for categorical variables. Categorical variables were compared using Pearson's  $\chi^2$ -test and Fisher's exact test and two-tailed *t*-test to compare two means and the Spearman's rank-order correlation test order for nonparametric correlations. The kappa statistic was used to measure agreement about the diagnosis of pulmonary embolism as determined by macroscopic and pathologic methods. Calculated kappa values of 0.40 are considered to reflect fair to poor reproducibility or agreement, those of 0.41 and 0.80 are consid-

ered to reflect moderate to substantial agreement, and those of 0.81 reflect almost perfect agreement. *P* values of 0.05 or less were considered statistically significant. All statistical analyses were performed by using SPSS version 13 and SAS version 9.1 for windows.

## 3. Results

In our study, the prevalence of pulmonary embolism was estimated 13.5%. Among 27 cases with diagnosis of pulmonary embolism, 75% were more than 50 years old. There was positive relationship between increasing of age and prevalence of pulmonary embolism ( $P = 0.001$ ) (Table 1). Pulmonary embolism was similar in two genders (men 8%, women 5.5%,  $P = 0.33$ ). In 7% of cases with pulmonary embolism, cause of disease was trauma and other etiologies were cardiovascular disease, malignancies, infectious diseases, and different types of surgeries. In 44.4% of cases with clinical suspicion of pulmonary embolism, cause of death was pulmonary embolism.

In histopathological study of samples, the most frequent findings were pulmonary infarct and hemorrhagic edema. In 17% of cases with pulmonary embolism diagnosed by macroscopic study, embolism was also confirmed by histopathological investigation, whereas in 3.5% of cases with negative diagnosis of pulmonary embolism in macroscopic study, the presence of emboli was confirmed by histopathological investigation. This finding showed that there was significant deference in diagnosis of pulmonary embolism between two methods ( $P < 0.0001$ ). Interpretation of results of two methods showed moderate to substantial agreement with kappa value 0.59. Also, in 34 of 200 cases with the probable diagnosis of pulmonary embolism, this complication was diagnosed before death and only in half of them diagnosis of pulmonary embolism confirmed by histopathological study and also in 4.5% of all cases that diagnosis was confirmed after death, disease was not diagnosed before death. There was significant deference in diagnosis of pulmonary embolism before and after the death ( $P < 0.0001$ ). Interpretation of results of these situations showed poor agreement with kappa value 0.34.

The most frequent site of emboli were end branches of the pulmonary artery.

Table 1  
Age distribution of thromboemboli in cadavers

Age group (years old)	Cadavers with thromboemboli (%)
0–10	0
11–20	0
21–30	4.7
31–40	7.0
41–50	13.3
51–60	23.0
61–70	26.0
71–80	26.0

#### 4. Discussion

In our study, the prevalence of pulmonary embolism in referred cadavers was 13.5%, whereas this prevalence in other studies was 8.3–14.7%.<sup>3–6</sup> In our study, 63% of cases with pulmonary thromboembolism were more than 50 years old, whereas in Sandler study, the age of more than 50 years was reported in 85% of cases.<sup>3</sup> Similar to Golin study<sup>8</sup>; we found no difference between two genders in the prevalence of pulmonary embolism. In present study, the main causes of death in 44.4% of cases were diagnosed as pulmonary embolism, whereas in Sandler study, in 37.5% of death, cause of death was pulmonary embolism.<sup>3</sup> Also, in our study, in 53% of cases diagnosis of pulmonary embolism before death was correct, but this rate in Morpurgo study was 34%.<sup>10</sup> In Anderson study, among all surgical patients who were discharge in 2003, 41% were at high to very high risk for venous thromboembolism.<sup>11</sup> In previous studies, it was shown that between 5% and 10% of in-hospital deaths are a direct result of pulmonary embolism<sup>3,12,13</sup> and if use of in-hospital VTE prophylaxis continues to be as poor, as reports to date suggest, a large proportion of these patients will be at risk of either sudden death or long-term morbidity due to thromboembolism.<sup>11</sup>

Pulmonary thromboemboli is one of the main causes of sudden death in respiratory system especially in hospitalized patients and disability and complications of pulmonary embolism was related to length of stay in hospital. Therefore, within our hospitals we recommend the following strategies for decreasing of its disabilities and death:

- (1) Minimising length of hospitalization and confinement to bed.
- (2) The use of preventative care such as limb physiotherapy.
- (3) The use of recent suitable therapy during long time hospitalization and in patients with risk factors for thrombosis (e.g. thromboembolic stockings). It was

concluded that the assessment of thromboembolism risk factors and application of evidence-based guidelines for its prophylaxis and treatment in medical patients as well as surgical patients could improve patient care and outcomes in our hospital population.<sup>14</sup>

- (4) Rapid start of treatment in patients with probable diagnosis of pulmonary embolism for the purpose of decreasing of disabilities and treatment costs.

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